

Carbon Stored in Wood and Paper Products

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Introduction

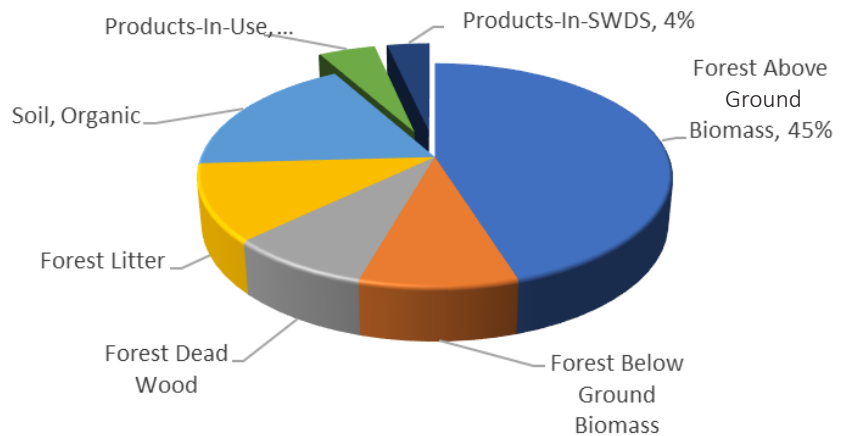
Trees remove carbon dioxide from the atmosphere and, via photosynthesis, convert this carbon dioxide into complex carbon-based substances that comprise wood and other parts of the tree. We refer to the carbon in these substances as forest carbon. Almost all of the sequestered carbon in the forest industry value chain is contained in three ‘pools’ – the forest (including above-ground and below-ground biomass), products-in-use, and products disposed of in landfills.

Carbon in the Forest

In the Forest, only a portion of forest carbon is stored in the parts of tree that we can see. The above-ground portion of trees contain only about 45% of the forest carbon stored in the U.S., while an equal fraction of forest carbon is stored in various other locations in the forest. (See Figure 1)

Figure 1. Forest carbon pools

(Data from Table A-230 in Annex to USEPA Inventory of Greenhouse Gas Sources and Sinks: 2017, published in 2019)

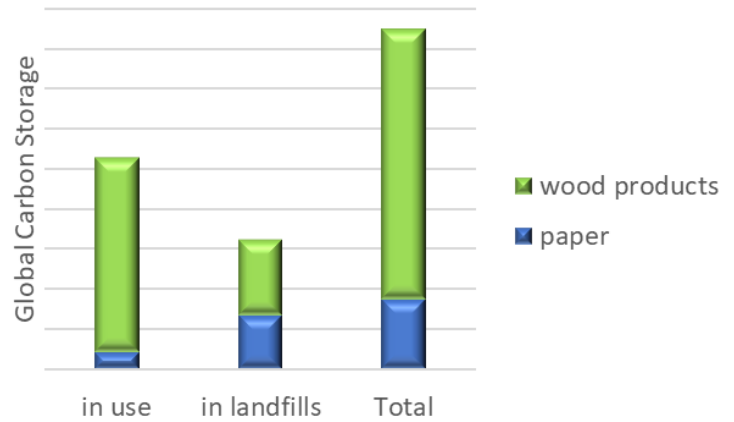


Carbon in Products-In-Use and in Landfills

Almost 10% of U.S. forest carbon is stored outside of the forest, in products-in-use and in solid waste disposal sites. When produced, these products typically contain one-half to two-thirds or more of the carbon that was in the original tree (USDA 2014, Table 6-A-5). Figure 2 shows that most of the carbon stored in products-in-use is stored in wood products. The carbon stored in a typical new single-family home is equivalent to about 24 metric tons of carbon dioxide (calculations available on request) and this carbon typically remains stored for 80 years or more (U.S. EPA 2019, Table A-226). Figure 2 shows that additional amounts of carbon are stored in landfills. This is especially important for paper products, which remain in use for relatively short periods compared to wood products.

Figure 2. Carbon stored in wood and paper products

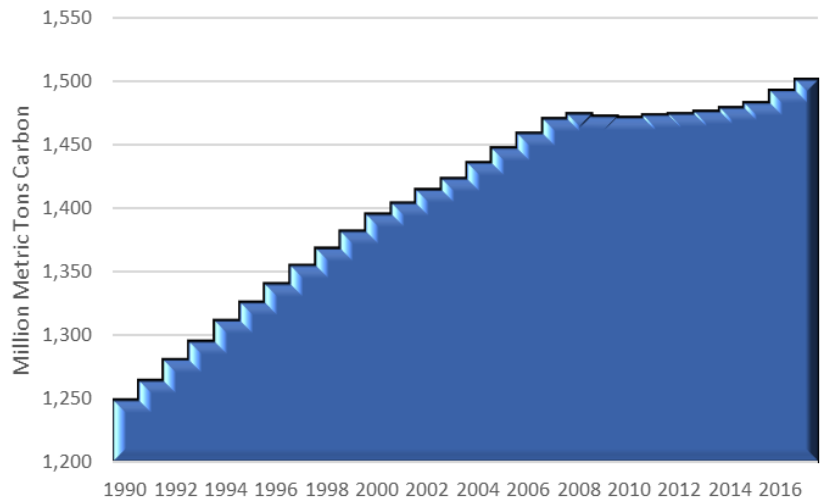
(Data from FAO Forestry 159, Impact of the global forest industry on atmospheric greenhouse gases, 2010)



More forest products are put in use every year, and because wood products remain in use for a long period, the amounts of carbon stored in products-in-use are increasing. Figure 3 shows that except during severe economic downturns, the pool of carbon stored in products-in-use grows every year, currently totaling over 1.5 billion metric tons. To put this in perspective, this is equivalent to more than three times the annual CO2 emissions from all electric power plants in the United States (electric power CO2 emissions data from USEPA Inventory of Greenhouse Gas Emissions and Sinks: 2017, published in 2019).

Figure 3. Carbon Stored in Products-In-Use

(Data from Table A-223 in Annex to USEPA Inventory of Greenhouse Gas Sources and Sinks: 2017, published in 2019).



Forest products do more than store carbon. For instance, when wood-based building materials are used in place of non-wood alternatives, the savings in greenhouse gas emissions are typically equal to more than twice the equivalent amount of carbon stored in the wood product (Sathre and O’Connor 2010).

Conclusion

Carbon stored in forests, forest products-in-use, and discarded forest products in landfills can represent an important part of the climate profile of the forest products industry. Clearly, this carbon storage as well as substitution effects need to be considered in any analysis of the industry’s opportunities to mitigate societal emissions of greenhouse gases.

References

Food and Agriculture Organization of the United Nations (FAO). 2010. Impact of the global forest industry on atmospheric greenhouse gases. Rome: FAO.

Sathre, Roger, and Jennifer O’Connor. 2010. “Meta-analysis of greenhouse gas displacement factors of wood product substitution.” *Environmental Science & Policy* 13 (2):104-114. doi: <http://dx.doi.org/10.1016/j.envsci.2009.12.005>.

United States Department of Agriculture (USDA). 2014. Quantifying Greenhouse Gas Fluxes in Agriculture and Forestry: Methods for Entity-Scale Inventory

United States Environmental Protection Agency (U.S. EPA). 2019. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2017. Washington, DC: U.S. EPA.

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